The partial translation of the cited reference No. 3 (JPP'2001-275118);

[0022]

[Embodiment of the Invention]

The main point of this invention is changing a quantizing scale according to the transmission quality of a transmission line.

[0023]

Hereafter, an embodiment of the invention is described in detail with reference to drawings.

[0024]

(Embodiment 1)

Fig. 1 is a block diagram showing the composition of the pictorial communication means of one embodiment of the invention 1.

Note that the same numerals are attached to the portion which is common to the portion as used in Fig. 8.

In addition, in this embodiment, although the transmission line is a wireless line, a wire can also be used.

[0025]

In Fig. 1, the pictorial communication means of this embodiment comprises an image encoding means 10 which encodes an input image data, a transmission processing means 11 which transmits the image data encoded by the an image encoding means 10, a reception processing means 12 which extracts an image signal from receiving signals, an image decoding means 13 which decodes the image data sent from the image signal sent from the reception processing means 12, a display means 14 which displays the image data decoded by the image decoding means 13 and a

transmission quality measuring means 15 which measures the transmission quality of the transmission line, from the receiving signals.

[0026]

The image encoding means 10 is provided with the motion compensation means 20, the subtractor 21, the discrete cosine transform means 1, the quantizer 2, the variable length encoding means 22, and the quantizing scale controller 23.

The motion compensation means 20 performs motion compensation processing in the case of inter encoding, and at the time when the inter encoding is implemented, outputs the image data treated by the motion compensation processing by predicting the macro block, enabling an error to be minimum from the image data of the frames which being adjacently arranged from each other.

Note that, at the time when the inter encoding is performed, nothing is processed.

The subtractor 21 takes a difference between the input image data and the image data which has been treated with the motion compensation by the motion compensator.

The discrete cosine transform means 1 transforms the input image data into the discrete cosine transformation, especially at the time when the inter encoding is performed, the input image data is transformed into the discrete cosine transformation, as well as when the inter encoding is performed, the difference between the input image data and the image data treated with the motion compensation in the motion compensator 20 is transformed into the discrete cosine transformation.

[0027]

The quantizer 2 quantizes the conversion factor which has

been transformed by the discrete cosine transformation with the discrete cosine transform means 1.

The variable-length-coding machine 22 performs to variable-length-encode the conversion factor quantized with the quantizer 2.

[0028]

The quantizing scale controller 23 calculates the generated code amount per frame from the target frame rate set up beforehand according to the quality of the transmission line measured by the transmission impairment measuring means 15 and The code amount per frame which was generated by the variable length code machine 22 is calculated.

And the negative feed back is applied to the quantizer 2 based on the difference value of those generated code amounts. In this case, by applying the negative feed back to the quantizer 2, when there are many dynamic image parts and there are many generated code amounts, the generated code amount is suppressed by enlarging a quantizing scale, while conversely, when there are few dynamic image parts and there are few generated code amounts, the generated code amount is increased by minimizing the quantizing scale, so as to keep the code amount constant. Note that, the quantizing scale controller 23 raises a target frame rate, when the transmission quality is bad, while, when the transmission quality is good, it serves to reduce the a target frame rate.

[0029]

The transmission processing part 11 performs a modulation procedure for transmitting the image code sequence from the variable length code machine 22 to a transmission line. The receiving processing part 12 receives the signal transmitted

from the distant office, and performs a demodulation processing for the received signals thereafter, the demodulated image code sequence are sent to the image decoder 13. The transmission impairment measuring means 15 measures the transmission quality with the received signals in the transmission line from a distant office to a local station, and outputs the result (transmission-quality information) to the transmission processing means 11. The transmission-quality information sent from the distant office contained in the received signal is detected, and it is output to the quantizing scale controller 23.

The display 14 carries out signal processing of the image data decoded with the image decoder 13, and displays it as an image.

[0030]

Next, operation of the pictorial communication equipment of the above-mentioned composition is explained using Figs. 2 and 3.

The state of a transmission line changes every moment according to the distance and movement speed between terminals. Fig. 2(a) is a figure showing, the state of a transmission line, i.e., an example of change of a receiving electric field level, with using a lateral axis as a time.

On the other hand, Fig.2 (b) is a figure showing the result of measuring the receiving electric field level as shown in Fig.2(a) measured by the transmission impairment measuring means 15, and it is expressed as a transmission-quality level.

A transmission-quality level is transmitted towards a distant office. The received transmission-quality level is given to the quantizing scale controller 23 in a distant office.

[0031]

Fig. 2(c) expresses the target frame rate set up with the quantizing scale controller 23. In the quantizing scale controller 23, by the transmission-quality level shown in Fig.2(b), if a transmission-quality level becomes low, a target frame rate will be set up highly, and if it becomes high, a target frame rate will be set up at low.

Here, as shown in Fig. 2(c), the value of a target frame rate is made into four frames per second in the section (A), and is made into eight frames per second in the section (B).

In this case, if a transmission-quality level becomes high, a target frame rate will be made into four frames per second, and if it becomes low, a target frame rate will be made into eight frames per second. These values assume to be used in a condition of low bit rate transmission, for example, about 64k bps wireless transfer.

[0032]

On the other hand, Fig.3(a) expresses as an image of the image code sequence coded with the image coder 10 in 1 second of time N-(N+1) in the section (A) in Fig.2(c). This is transmitted to a distant office.

In this figure, the lattice in the frame of a picture expresses a macro block.

The block shown as the solid line, shows an intra coding block, and 1 block shall exist in one frame.

Even if the block in an adjacent flame was not reproduced by the error of a transmission line, the intra coding block can completely be reproduced.

In this example, it is divided into 16 blocks here and all the pictures are refreshed with the intra coded blocks in

16 frames.

[0033]

Fig. 3(b) shows a process in which after receiving the image code sequence of Fig. 3 (a) by the receiving processing part 12, it is decoded with the image decoder 13, and it is displayed with the display 14.

Fig. 3(c) shows an image of the image code sequence coded with the image coder 10 for 1 second of time M-(M+1) in the section (B) of Fig. 2(c).

This is transmitted to a distant office.

Fig. 3(d) shows a process in which after receiving the image code sequence of Fig. 3 (c) by the receiving processing part 12, it is decoded with the image decoder 13, and it is displayed with the display 14.

[0034]

Here, operation in the transmission line shown in Fig. 2(a) is explained. If the original image shown in Fig. 3(a) is inputted, after the discrete cosine transform of the block to be intra-coded is carried out in the discrete cosine transform machine 1, in the quantizer 2, it will be quantized with the quantizing scale set up with the quantizing scale controller 23.

And the quantized data is coded with the variable length code machine 22. The block to be inter-coded, is coded like the above-mentioned intra coding processing, with difference data with the data of the adjacent frame from the motion compensation machine 20. In the section (A), since the target frame rate is set as four frames per second, the frame number of the image coding sequence acquired will be four frames per second like Fig. 3(a).

[0035]

Next, the image coding sequence is transmitted to a distant office. If an error arises in the image data sent at the time N in the transmission line, as shown in Fig. 3(b), a part thereof cannot be decoded and thus that portion cannot be displayed. Here, if an error arises in 1 block, it assumes that that block picture was not able to be decoded and a transit delay is set to d in this case, in the 3rd frame after the error has been occurred, i.e., N+d+2/4 seconds, later, it is refreshed and a right image can be decoded and displayed.

However, the transmission quality is bad, and when 3 blocks of errors arise, full screen refreshment cannot be performed in said time (N+d+2/4 seconds).

[0036]

Then, in a case when the transmission quality is bad in which many errors arise, the situation will become a similar condition as shown in the section (B) and since in this section (B), a target frame rate is set as eight frames per second, the frame number of the image coding sequence acquired will be eight frames per second, as shown in Fig. 3(c).

If it assumes that the error arose in the 3-block data of the image sent at the time M, as shown in Fig. 3(d), it will become impossible here, to display 3 blocks of the image of time M+d.

However, as shown in the figure, since an opportunity to be refreshed by the intra-coded blocks will be increased due to the number of frames being increased, although it is the 5th frame, the all of images can be refreshed after the time M+d+4 /8 seconds has been elapsed.

[0037]

Thus, according to this embodiment, since the size of a quantizing scale is controlled according to the transmission quality and a frame rate is raised when the transmission quality is deteriorated, the image quality deterioration by the error of the data in a transmission line can be suppressed to the minimum.